

CASE 5072: Application of NORTHERN
MINERALS, INC. FOR A WATERFLOOD
PROJECT, MCKINLEY COUNTY, N. M.

CASE No.

5072

Application,

Transcripts,

Small Exhibits

ETC.

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
CONFERENCE ROOM, STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO
October 3, 1973

EXAMINER HEARING

IN THE MATTER OF:

Application of Northern Minerals, Inc.)
for a waterflood project, McKinley)
County, New Mexico.)

Case No. 5072

BEFORE: RICHARD L. STAMETS,
Examiner.

TRANSCRIPT OF HEARING

1 MR. STAMETS: Call next case 5072.

2 MR. DERRYBERRY: Case 5072, Application of
3 Northern Minerals, Inc. for a waterflood project,
4 McKinley County, New Mexico.

5 MR. DAVIDSON: Mr. Examiner, Lloyd Davidson
6 of Northern Minerals.

7 MR. STAMETS: L-l-o-y-d?

8 MR. DAVIDSON: Yes. This is Mark Weidler,
9 W-e-i-d-l-e-r.

10 MR. STAMETS: Hold it a minute while I shuffle
11 through the remaining papers here. Are there any
12 other appearances here? The witness will stand and
13 be sworn, please.

14 (Whereupon, the witness was sworn.)

15 MR. STAMETS: You may proceed, Mr. Davidson.

16 *****

17 MARK WEIDLER,
18 a witness, having been first duly sworn according to
19 law, upon his oath testified as follows:

20 DIRECT EXAMINATION

21 BY MR. DAVIDSON:

22 Q This is an application for a pilot waterflood in
23 Section 29, of 16 North, 6 West. Northern Minerals
24 drilled a shallow well we call the #6-Y Santa Fe
25 Pacific, and we recovered very little oil. We
elected to attempt a pilot waterflood program by

1 drilling two potential producers south of the
2 injection well or south of the 6-Y and using the
3 6-Y as our injection well and drill a water well
4 north of there to use as the water supply.

5 We would like permission to inject water
6 through the original 6-Y well which we will now use
7 as an injection well and attempt to produce oil out
8 of the two wells that we drilled south of the 6-Y.

9 MR. DAVIDSON: Now, that is the general
10 statement. Mr. Weidler is prepared to answer the
11 questions concerning this.

12 MR. STAMETS: Let's go off the record.

13 (Whereupon, a discussion was held off the
14 record.)

15 MR. STAMETS: If you will introduce or have
16 your witness introduce himself and qualify him.

17 THE WITNESS: My name is Mark Weidler. I am
18 a consultant petroleum geologist with Colorado Plateau
19 Geological Services, Farmington, New Mexico.

20 MR. STAMETS: Mr. Weidler, have you ever
21 appeared before this Commission or had your qualifica-
22 tions --

23 THE WITNESS: No, I have not.

24 MR. STAMETS: If you would briefly state your
25 educational background and your experience.

1 THE WITNESS: I have a Bachelor of Science
2 and Master of Science degrees of Geology from the
3 University of Nebraska. Baccalaureate was in 1953.
4 Master's in 1954.

5 I was employed by Shell Oil Company as an
6 exploration geologist from 1954 through April of
7 1971, and have been a consultant petroleum geologist
8 in Farmington from May of 1971 through the present
9 time.

10 MR. STAMETS: You are familiar with the
11 application?

12 THE WITNESS: I am, yes.

13 MR. STAMETS: All right. The witness is
14 qualified.

15 Q (By Mr. Davidson) Mr. Weidler, I suppose it would
16 be best for you just to commence with the procedure
17 that you propose to use in the wells that have been
18 drilled and where they are located and tell it in
19 a narrative form.

20 A Mr. Examiner, we provided several brochures there,
21 background which contained the essential documents
22 to support this application. We have provided in
23 synopsis form a background of proposed plan. I can
24 either read it or excerpt it as would best suit the
25 case. In essence --

1 Q Excerpting it.

2 MR. STAMETS: Excerpting it would be fine.

3 A As Mr. Davidson said, they drilled a test well near
4 the center of Section, southwest, northeast Section 29
5 of 16 North, 6 West. The well is located on a
6 structural feature known as Miguel Creek Dome. We
7 encountered oil sands in the course of the pay zone
8 approximately 80 feet above the massive Gallup
9 sandstone.

10 We made a completion of the #6-Y which is
11 shown on the schematic of the well and is shown as
12 Figure No. 4 and produced a small amount of oil with
13 pumping from open-hole intervals from 734 to 748
14 over-all. Oil sand occurs from 734 to 744.

15 The nature of the crude produced at this
16 location indicated gravity is in the range of 31 to 33
17 degrees and there is no, the crude oil is essentially
18 devoid of essentiated petroleum gasses, methane through
19 pentane; and as a result, there is very little primary
20 reservoir energy available to move the oil into the
21 well bore to be produced.

22 In light of this, we consider the possibility
23 of injecting water into the formation and using
24 injected water as a primary source of reservoir energy
25 for moving the oil into the well bore for production.

1 For this purpose, Northern Minerals drilled
2 their Santa Fe Pacific Number 7 and Number 8; and
3 if you will refer to figure Number 2, a blow-up plat
4 to the scale of one inch equals 200 feet is shown
5 illustrating the aerial relationships of the wells
6 involved, SFP #6-Y being the original completion well.

7 We have drilled Number 7 and Number 8 and
8 effected open-hole completions with casings set on
9 top of the oil pay and the completion schematic for
10 Number 7 and Number 8 are shown as Figures Number 5
11 and Number 6. What we propose is to take water
12 produced from the massive Gallup formation at a depth
13 of approximately 810 feet and using a Gaso Model 3364
14 injection pump inject into the Santa Fe Pacific #6-Y
15 and withdraw in Santa Fe Pacific Number 7 and Number 8
16 in the pilot.

17 The water supplies well, as you can see in the
18 plat, is located approximately 137 feet north, northwest
19 of the Santa Fe Pacific 6-Y; and that is the essential
20 aspect. Our feeling is that by injection of water into
21 the formation we may establish sufficient reservoir
22 energy to produce oil in Number 7 and Number 8 at
23 commercial rates and certainly improve the recovery of
24 in-place oil that has been evident in cores cut in
25 these wells.

1 MR. STAMETS: Does that conclude your direct
2 evidence?

3 MR. DAVIDSON: Except that we have a letter
4 from Tenneco Oil Company that Tenneco consents,
5 Tenneco being the only offsetting lease owner as
6 shown on the plat that you have there. We have a
7 letter from Tenneco here that I'll be glad to
8 introduce in which Tenneco consents to this program.

9 CROSS-EXAMINATION

10 BY MR. STAMETS:

11 Q Mr. Weidler, Figure Number One seems to show a fault
12 running from the northeast to the southwest in this
13 area immediately to the south of the proposed pilot
14 project.

15 A Yes. That fault is a very tentative fault. It was
16 interpreted pre-drilling and the plat I used here was
17 primarily for illustrating locations of nearby wells
18 and the lease situation rather than to illustrate the
19 configuration of the formation at the Hospah level.

20 Q How long do you anticipate it will be before you
21 see some sort of a response from the producing wells?

22 A I would anticipate seeing a response, some response
23 within thirty days and perhaps sooner.

24 Q What is the nature of the Gallup water?

25 A The Gallup water, I'm not prepared to submit a water

1 analysis. We wanted to produce the formation for
2 awhile before collecting a sample for analysis. It
3 is quite fresh in the area. From other analyses I've
4 seen, we are looking at probably total solids on the
5 order of 1500 to 2000 parts per million or less.

6 It is potable, drinkable. We have no reason
7 to believe that the Gallup water will not be compatible
8 with the formation to which it will be injected.

9 Q Do you anticipate any corrosion problems?

10 A No, we do not.

11 Q How is the injection to be accomplished, through
12 tubing under a packer?

13 A No. The water will be injected down in the four and
14 a half inch casing, if you will refer to Figure Number
15 4. In this hole, the casing was set at a depth of
16 733.4 feet and the interval drilled out; and we will
17 be injecting down in the casing into the open-hole
18 interval from 734 to 744.

19 Q In that case, you are only injecting into the 6-Y well
20 and that cement has been circulated to the surface?

21 A It was. Yes, sir.

22 Q Is there any shallow fresh ground water in this area
23 above the Gallup?

24 A Not to our knowledge. The surface is under terrain
25 by the Hoshpah sandstone to a depth of approximately the

1 surface down to about 220 feet. It is possible there
2 may be potable water in that formation, but I can't
3 testify to that. We had no waterflow, no evidence
4 of water during the drilling phase.

5 Q Have you made any calculations as to the frac pressure
6 in the area and pressures that you should not exceed
7 in this project?

8 A No, we have not. Based on the Cornell's of the sounds
9 of the porosities and permeabilities, the porosities
10 are in the range of 20 to 27 percent; and the
11 permeabilities range from 100 up to 300 or 400 millidarcies.

12 We plan not to exceed approximately 750 pounds
13 of injection pressure. We feel that we can initiate
14 injection with those pressures and that would be
15 approximately equivalent to the geostatic gradient, and
16 we would not expect any breakdown at those pressures.

17 Q Would it be fairly simple for you to submit that
18 calculation after the Hearing?

19 A We could, yes. I'd have to make some arrangements
20 for that.

21 Q This wouldn't cause any unnecessary delay?

22 A I don't believe so.

23 Q The way that the injection well is currently set up,
24 if there was a hole in the casing or a hole and a
25 void in the same end, then it is possible that water

1 could escape and you would not be aware of it while
2 you were injecting it?

3 A It is possible. The injection of water will be
4 metered and the pressure monitored at the surface;
5 but we would have no immediate means of detecting
6 such a leak.

7 Q If this developed into a long-term project, would it
8 seem to be reasonable to institute either
9 injection under tubing and packers or some other
10 means of determining leakage?

11 A It would be feasible, and this could be done. We
12 felt for our purposes here that the mechanical
13 arrangement would be adequate for the pilot.

14 Q What are we looking at, a year for the pilot project?

15 A I would say anywhere from a month to probably six
16 months at the outside. Mr. Davidson may want to
17 amplify on that.

18 MR. DAVIDSON: No. That's all we know.

19 Q And you do not seek any additional injection wells
20 at this time?

21 A Not at this hearing, sir.

22 MR. STAMETS: Are there any other questions?

23 Mr. Arnold?

24 CROSS-EXAMINATION

25 BY MR. ARNOLD:

1 Q Mr. Weidler, what were your oil-water saturations
2 taken of the Cornell Core Analysis?

3 A If you will allow me, I'll just give you an idea
4 here from the Core Analysis. On Santa Fe Pacific
5 Number 7, the Core Analysis Data covers the interval
6 from 765 feet to 771 feet. The indicated oil
7 saturations range from a minimum of 19.0 percent up
8 to a maximum of 32.4 percent.

9 The water indicated, water saturations range
10 from a minimum of 3.7 percent to a maximum of 31.9
11 percent on Santa Fe Pacific Number 8 which will be
12 the other.

13 Q Excuse me just a minute. How could you account for
14 the wide variation within the one core, 3.7 to 31.9?
15 Do you have a shell break-in?

16 A Yes. There are some shell laminations in the intervals,
17 and the water I personally believe is unduly low because
18 we were unable to package the cores in a sealed
19 container prior to analysis. I'm sure we have lost
20 some water by evaporation prior to analysis.

21 Q You haven't testified at all as to whether or not you
22 think there is an oil-water contact in the area or
23 exactly what the situation is.

24 A No. We have no, from the data presently at hand, we
25 have not established the limits of this accumulation.

1 I can testify that all of the wells that we have
2 drilled in connection with establishing this pilot
3 waterflood have encountered, we have cored the Hospah
4 zone and have encountered oil.

5 What we envision is if the pilot flood is
6 effective, then we would simply go on a patterned
7 spacing yet to be determined, probably 20-acre
8 alternating producers and injectors as a development
9 phase of this project.

10 Q Do you think that the 6-Y well, that's the one you
11 are going to inject, you did encounter both oil and
12 water in it, also, or your water saturation is higher
13 in the 6-Y?

14 A No. They are essentially the same in all of the cores.
15 Within the standards you can establish for cores or
16 porosities or permeabilities of the water, saturations
17 were in the range that I have on the Number 7. Oil
18 saturations were in the range from 20 to 30 percent.

19 Water saturations were from low up to maximum
20 of about 40 percent and porosities in the 20 to 27
21 percent range. As I see it, we are in the accumulation
22 with this project and not establishing a flood from
23 edgewater into the accumulation.

24 Q You would just be primarily a stratigraphic or a
25 structural accumulation or both or how do you --

1 A Well, it's difficult to make a definitive statement.
2 Miguel Creek Dome is a fairly large closed structure
3 and fairly well documented in the literature, and
4 there is no question about the size of the closure.
5 The location of this project is on the north plunge
6 of that anticline considerably downdip from the
7 mapable culmination.

8 The sand that we are dealing with is a Marine
9 sandstone that has the primarily anticlinal character-
10 istics. It is possible that ultimately we will find
11 that stratigraphic factors are important in the
12 accumulation. I can't testify that that is the fact
13 at this state. I'd have to consider it basically a
14 structural accumulation from the data at hand so far.

15 Q How long do you anticipate that it will take to get
16 some sort of a response from these other two wells?

17 A As I mentioned, I would expect some response within
18 thirty days.

19 Q Within thirty days?

20 A Yes.

21 MR. ARNOLD: I believe that's all.

22 MR. STAMETS: Mr. Davidson, this bunch of
23 papers here in the black folder is your Exhibit 1?

24 MR. DAVIDSON: Yes.

25 MR. STAMETS: Would you like to offer that

1 into evidence?

2 MR. DAVIDSON: We would.

3 MR. STAMETS: Without objection, Exhibit 1
4 will be admitted. Is there anything further in
5 this case? Mr. Weidler, the Examiner would like
6 to have the calculations of the fractured pressure
7 in there; and at a later date, we would like to have
8 a water analysis on the Dakota water.

9 MR. DAVIDSON: We will submit it.

10 MR. STAMETS: The witness may be excused.
11 Anything further in this case? We will take the
12 case under advisement.

13 *****

14 REPORTER'S CERTIFICATE

15 I, JANET RUSSELL, a Court Reporter, in and
16 for the County of Bernalillo, State of New Mexico, do
17 hereby certify that the foregoing and attached
18 Transcript of Hearing before the New Mexico Oil
19 Conservation Commission was reported by me; and that
20 the same is a true and correct record of the said
21 proceedings to the best of my knowledge, skill and
22 ability.

23 
24 COURT REPORTER
25

I N D E X

WITNESS.

MARK WEIDLER

Page

Direct Examination by Mr. Davidson	3
Cross-Examination by Mr. Stamets	8
Cross-Examination by Mr. Arnold	11

E X H I B I T S

Applicant's

Offered

Admitted

Exhibit 1	Map	15	15
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I do hereby certify that the foregoing is
a complete record of the proceedings in
the Examiner hearing of Case No. 5772
heard by me on October 3, 19 73.
Richard L. Stam, Examiner
New Mexico Oil Conservation Commission

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO
P. O. BOX 2088 - SANTA FE
87501

August 30, 1974

I. R. TRUJILLO
CHAIRMAN

LAND COMMISSIONER
ALEX J. ARMijo
MEMBER

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

Mr. Lloyd Davidson
Northern Minerals, Inc.
P. O. Box 2182
Santa Fe, New Mexico 87501

Dear Mr. Davidson:

Your request for permission to convert your SFPRR Well No. 8 to an injection well, dated August 28, 1974, has been received and reviewed.

It should be noted that on October 3, 1973, the Oil Conservation Commission, at a public hearing, considered your application for a waterflood project in Case 5072. Subsequently Order No. R-4649 authorized institution of such a project by injection of water into the Gallup formation through the casing of your SFPRR Well No. 6-Y. One of the provisions stipulated that this authorization would be for a six-month period only, at which time injection through casing would terminate. On June 20, 1974, you requested a six-month extension of this order. At that time you were given permission to continue injecting water through the casing of your Well No. 6-Y until such time as another hearing could be held to consider elimination of the requirements for injection of water through tubing set in a packer. This hearing is scheduled for September 18, 1974, and the subject matter will be considered by Case 5321.

In view of the foregoing, it has been determined that you should be granted permission to convert your Well No. 8 to an injection well and inject water through the casing into the Hospah Sand as requested. Furthermore, such authorization is only for the period from date of this letter until Case 5321 has been heard and a decision pertaining thereto has been reached.

Yours truly,

Carl Ulvog

CARL ULVOG
Senior Geologist

CU/og

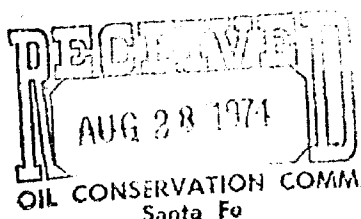
Northern Minerals, Inc.

TELEPHONE (505) 983-9689

LLOYD DAVIDSON
President

P. O. Box 2182
SANTA FE, NEW MEXICO 87501

August 28, 1974



Re: Northern Minerals McKinley
Gallup Waterflood Project
Case No. 5072
Order No. R-4649

Mr. A. L. Porter, Jr.
Secretary-Director
Oil Conservation Commission
P. O. Box 2038
Santa Fe, New Mexico 87501

Dear Sir:

Request is made that Northern Minerals, Inc., be allowed to convert it's SFPRR No. 8 well to an injection well. See Attached maps and plats.

For some months now, during the pilot flood program, water has been injected into the Hospah sand through the No. 6-Y well and oil has been produced through the Nos. 7 and 8 wells. More recently, the No. 11 well was drilled and is producing oil. The water is taken from the Massive Gallup.

Our studies have shown that the approximate limit of water injection through one well, at reasonable pressures, is 350 barrels per day. We have also found that, within reason, the more water injected the more oil is produced.

The No. 8 well is making only about 1 barrel oil per day. The Nos. 7 and 11 produce about 20 barrels per day. It is believed that a channel developed between the injection well and No. 8 because, in the early stages of the pilot program, we attempted to force too much volume at too high pressure into the one well, the No. 6-Y.

The No. 8 well offsets the No. 7 well. It is believed that water injected in the No. 8 will result in a better sweep of the producing area and will materially increase the oil production from No. 7 and No. 11. It is planned to inject about 350 barrels per day in No. 8, a total of 700 barrels through two injection wells.

(2)

The present water supply is ample. Both injection wells can be handled with our present injection pump at the 6-Y well. The plan would be to simply lay a line from the 6-Y well to the No. 8, a distance of about 425 feet and begin injecting through the casing. The casing is $4\frac{1}{2}$ " O. D. 10.5# and is cemented with 65 sacks. It is set on top of the pay zone. The completion was through open hole. There is at present 2-3/8" tubing in the well and a down hole pump and rods. Efforts have been made to pull the rods and pump but they are stuck. Our plan is to inject through the casing now and, if oil production is increased, to figure out at a later date how to get the pump, rods and tubing out of the hole.

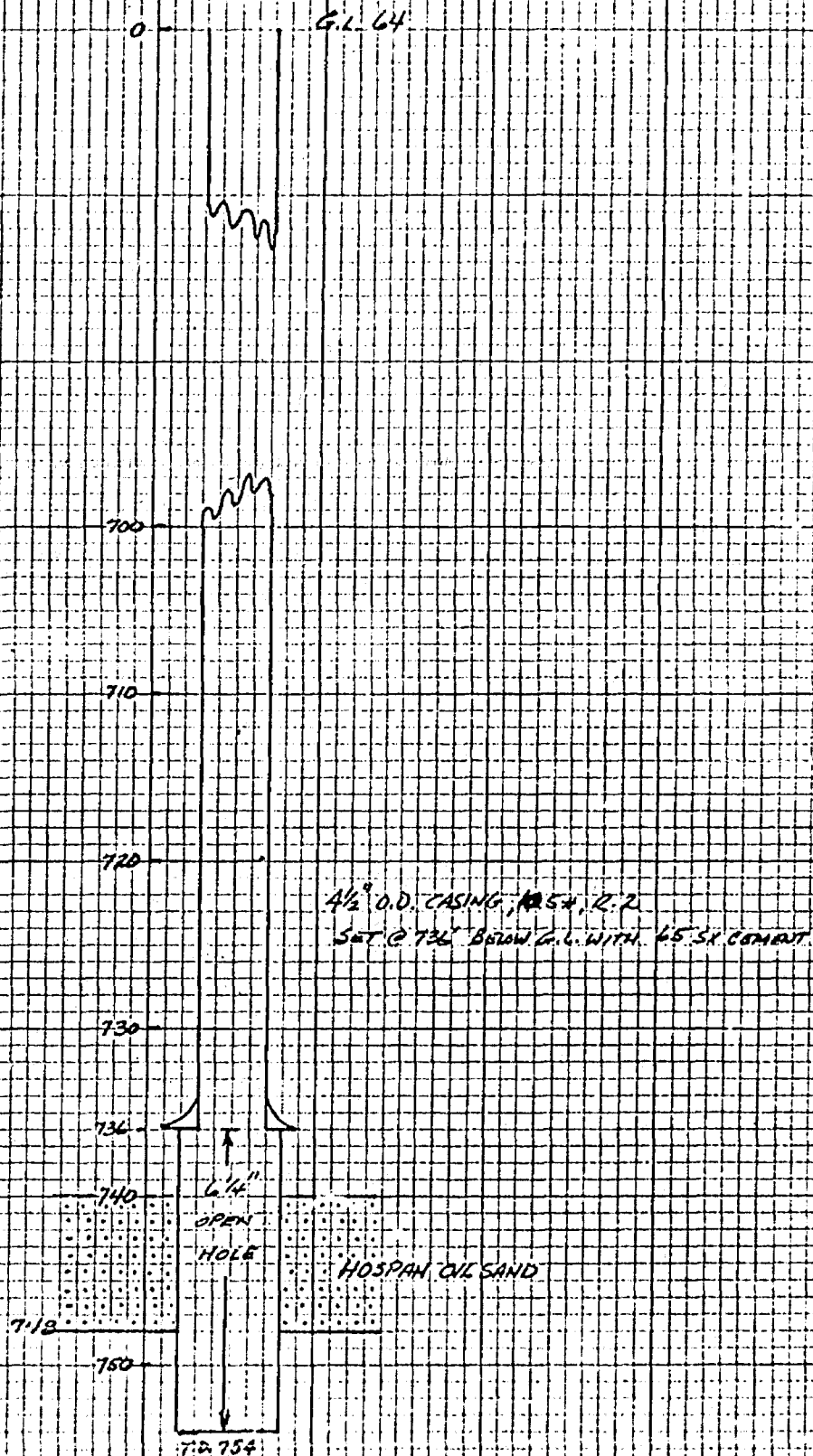
We have a rig on the premises now. This rig is going on a long contract with Phillips Petroleum next week and we don't know where we can get another one. For this reason, we would like permission to do the foregoing work immediately. As the attached map shows, Northern Minerals owns a lease covering all offsetting locations.

Very truly yours,

Northern Minerals, Inc.

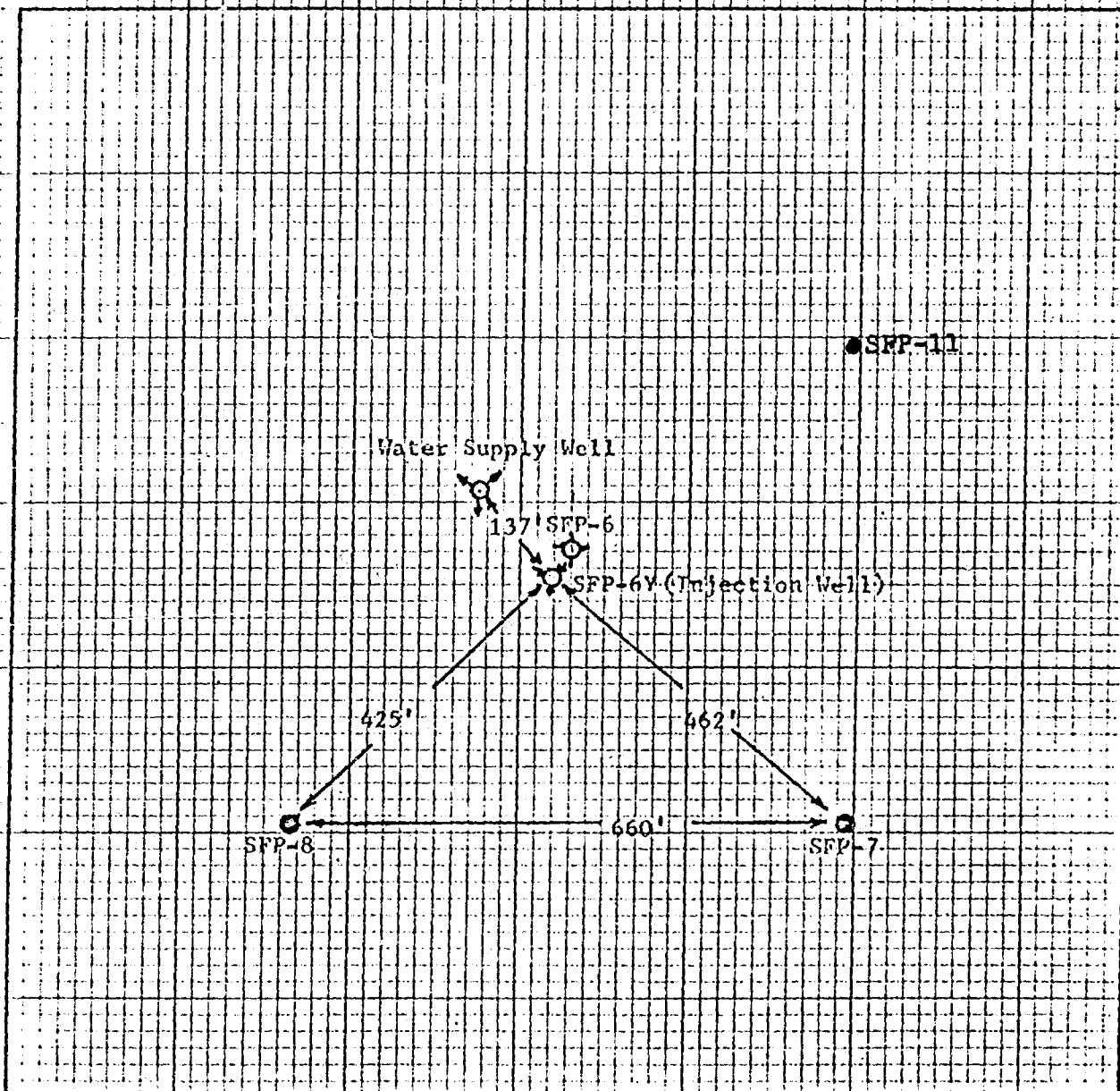
Lloyd Davidson
By: Lloyd Davidson, President

NORTHERN MINERALS, INC.
SANTA FE PACIFIC NO. 8
OIL PRODUCER



NORTHERN MINERALS, INC.

Plat of SW/4 NE/4, Section 29-T16N-R6W
McKinley County, New Mexico



Scale: 1" = 200'

NEW MEXICO OIL CONSERVATION COMMISSION
GAS-OIL RATIO TESTS

C-116
Revised 1-1-65

Operator Northern Minerals, Inc.		Pool Unnamed				County McKinley										
Address P. O. Box 2182, Santa Fe, New Mexico 87501						TYPE OF TEST - (X)		Scheduled <input type="checkbox"/>		Completion <input checked="" type="checkbox"/>		Special <input type="checkbox"/>				
LEASE NAME	WELL NO.	LOCATION				DATE OF TEST	STATUS	CHOKE SIZE	TBG. PRESS.	DAILY ALLOWABLE	LENGTH OF TEST HOURS	PROD. DURING TEST				GAS - OIL RATIO CU.FT/BBL
		U	S	T	R							WATER BBLs.	GRAV. OIL	OIL BBLs.	GAS M.C.F.	
SFPRR	7	G	29	16N	6W	11-22-73		Open Hole	0	8	24	8	31	8	0	0/8
<p>NOTE: THE SFP NO. 7 WILL BE THE MOST AFFECTED WELL IF THE NO. 8 WELL IF CONVERTED TO AN INJECTION WELL. THE NO. 7 WELL PRODUCED NO OIL PRIOR TO WATER INJECTION IN THE NO. 6-Y. AFTER INJECTION THE WELL PRODUCED 8 BARRELS OIL PER DAY.</p>																

No well will be assigned an allowable greater than the amount of oil produced on the official test.

During gas-oil ratio test, each well shall be produced at a rate not exceeding the top unit allowable for the pool in which well is located by more than 25 percent. Operator is encouraged to take advantage of this 25 percent tolerance in order that well can be assigned increased allowables when authorized by the Commission.

Gas volumes must be reported in MCF measured at a pressure base of 15.025 psia and a temperature of 60° F. Specific gravity base will be 0.60.

Report casing pressure in lieu of tubing pressure for any well producing through casing.

Mail original and one copy of this report to the district office of the New Mexico Oil Conservation Commission in accordance with Rule 301 and appropriate pool rules.

I hereby certify that the above information is true and complete to the best of my knowledge and belief.

Lloyd Davidson
Lloyd Davidson

(Signature)

President

(Title)

12-10-73

(Date)

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Page No. 3

CORE ANALYSIS RESULTS

Company NORTHERN MINERALS, INC. Formation HOSPAN File 9103
Well SFPRR NO. 8 Core Type DIAMOND 2-1/8" Date Report 9-20-73
Field WILDCAT Drilling Fluid WATER BASE MUD Analysts RG
County MC KINLEY State NEW MEX. Elev. 6424' GL Location SW SW NE SEC 29-T15N-R6W

Lithological Abbreviations

SAND-SO SHALE-SH LIME-LN	DOLOMITE-DOL CHERT-CH GYPSUM-GYP	ANHYDRITE-ANH CONGLOMERATE-CONG FOSSILIFEROUS-FOSS	SANDY-SOY SHALT-SHY LIMY-LMY	FINE-FN MEDIUM-MED COARSE-CSE	CRYSTALLINE-XLN GRAIN-GRN GRANULAR-GRNL	BROWN-BRN GRAY-GY VUGGY-VGY	FRACTURED-FRAC LAMINATION-LAM STYLOLITIC-STY	SLIGHTLY-SL VERY-V/ WITH-W/
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SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCY	POROSITY PER CENT	RESIDUAL SATURATION PER CENT PORE		SAMPLE DESCRIPTION AND REMARKS
				OIL	TOTAL WATER	
		(K _A)			(CONVENTIONAL ANALYSIS)	
1	735.6	47	23.3	0.0	19.3	Sd Gy Fn Grn Clay
2	737.5-38	47	23.3	18.2	27.3	Sd Gy Fn Grn Sl/Clay
3	738.7	35	21.1	15.3	24.4	Sd Gy Fn Grn Sl/Clay
4	740.5-41	32	16.2	4.6	13.0	Sd Gy Fn Grn Sl/Clay
5	41-42	82	25.5	22.2	37.0	Sd Gy Fn Grn Sl/Clay
6	42-43	141	26.8	26.3	24.8	Sd Gy Fn Grn Sl/Clay
7	43-44	122	26.0	26.2	18.3	Sd Gy Fn Grn Sl/Clay
8	44-45	209	25.6	24.4	22.8	Sd Gy Fn Grn Sl/Clay
9	45-46	169	25.3	33.2	15.8	Sd Gy Fn Grn Sl/Clay
10	46-47	255	23.5	24.7	10.6	Sd Gy Fn Grn Sl/Clay

Service No. 5-A

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

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NEW MEXICO OIL CONSERVATION COMMISSION

Form C-103
Supersedes Old
C-102 and C-103
Effective 1-1-65

5a. Indicate Type of Lease	
State <input type="checkbox"/>	Fee <input checked="" type="checkbox"/>
5. State Oil & Gas Lease No.	

SUNDRY NOTICES AND REPORTS ON WELLS

(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT -" (FORM C-101) FOR SUCH PROPOSALS.)

1. <input checked="" type="checkbox"/> OIL WELL <input type="checkbox"/> GAS WELL <input type="checkbox"/> OTHER-	7. Unit Agreement Name
2. Name of Operator Northern Minerals, Inc.	8. Farm or Lease Name SFPRR
3. Address of Operator P. O. Box 2182, Santa Fe, New Mexico 87501	9. Well No. 11
4. Location of Well UNIT LETTER <u>G</u> <u>1660</u> FEET FROM THE <u>North</u> LINE AND <u>1650</u> FEET FROM THE <u>East</u> LINE, SECTION <u>29</u> TOWNSHIP <u>16N</u> RANGE <u>6W</u> NMPM.	10. Field and Pool, or Wildcat Undesignated Gallup
15. Elevation (Show whether DF, RT, GR, etc.) 6424 GL, 6429 RT	12. County McKinley

16.

Check Appropriate Box To Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:		SUBSEQUENT REPORT OF:	
PERFORM REMEDIAL WORK <input type="checkbox"/>	PLUG AND ABANDON <input type="checkbox"/>	REMEDIAL WORK <input type="checkbox"/>	ALTERING CASING <input type="checkbox"/>
TEMPORARILY ABANDON <input type="checkbox"/>	CHANGE PLANS <input type="checkbox"/>	COMMENCE DRILLING OPNS. <input checked="" type="checkbox"/>	PLUG AND ABANDONMENT <input type="checkbox"/>
PULL OR ALTER CASING <input type="checkbox"/>	OTHER <input type="checkbox"/>	CASING TEST AND CEMENT JOB <input checked="" type="checkbox"/>	
		OTHER <u>Plugging Back</u> <input type="checkbox"/>	

17. Describe Proposed or Completed Operations (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work) SEE RULE 1103.

Well spudded 5-1-74. Set 64' of 7" surface casing with 12 sacks cement. Drilled to TD of 3062' in Entrada sandstone. TD reached 5-12-74. Ran E-Log and Gamma Ray. DST 3009' to 3062'. Recovered 2770' water. Cores were taken in Hospah-Gallup sandstone 730'-750', Todilto limestone 3022'-2042' and Todilto-Entrada 3042'-3062'. On 5-14-74 cement plugs were spotted as follows: 50' on bottom from 3012 to 3062', plug across Dakota "D" from 1780' to 1880' and from 920' to surface with 175 sacks. WOC 24 hours. 5-15-74 drilled out cement plug to 754'. 5-16-74 ran and cemented 24 joints (731') of 4½", 9.5# casing with 75 sacks cement. WOC 48 hours. 5-18-74 Drilled out plug and worked to bottom. 5-19-74 fracture treated open hole 731' to 754' with 5,000 gal lease crude and 4,000# 10-20 mesh sand. Back flowed load oil to tank truck. 5-21-74 hooked up flow lines and flowed well to tanks. SICP 180 PSI. FCP 80#. Took potential test from 2 P. M 5-22-74 to 5 P. M. 5-23-74 (27 hours). Flowed 16 barrels oil and 48 barrels water. Well completed flowing 5-23-74.

18. I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNED Clayton Davidson TITLE President DATE 5-25-74

APPROVED BY _____ TITLE _____ DATE _____
CONDITIONS OF APPROVAL, IF ANY:

NO. OF COPIES RECEIVED	
DISTRIBUTION	
SANTA FE	1
FILE	1
U.S.G.S.	2
LAND OFFICE	
OPERATOR	1

**NEW MEXICO OIL CONSERVATION COMMISSION
WELL COMPLETION OR RECOMPLETION REPORT AND LOG**

Form C-105
Revised 1-1-55

5a. Indicate Type of Lease
State ☐ Fee ☒

5. State Oil & Gas Lease No.

1a. TYPE OF WELL OIL WELL <input checked="" type="checkbox"/> GAS WELL <input type="checkbox"/> DRY <input type="checkbox"/> OTHER <input type="checkbox"/>				7. Unit Agreement Name	
b. TYPE OF COMPLETION NEW WELL <input type="checkbox"/> WORK OVER <input type="checkbox"/> DEEPEN <input type="checkbox"/> PLUG BACK <input type="checkbox"/> OIL RESVR. <input type="checkbox"/> OTHER <input type="checkbox"/>				8. Form or Lease Name SFPRR	
2. Name of Operator Northern Minerals, Inc.				9. Well No. 11	
3. Address of Operator P. O. Box 2182, Santa Fe, New Mexico 87501				10. Field and Pool, or Wildcat Undesignated Gallup	
4. Location of Well UNIT LETTER <u>G</u> LOCATED <u>1660</u> FEET FROM THE <u>North</u> LINE AND <u>1650</u> FEET FROM THE <u>East</u> LINE OF SEC. <u>29</u> TWP. <u>16N</u> RGE. <u>6W</u> NMPM				12. County McKinley	
15. Date Spudded 5-1-74	16. Date T.D. Reached 5-12-74	17. Date Compl. (Ready to Prod.) 5-23-74	18. Elevations (DF, RKB, RT, GR, etc.) 6424 GL, 6429 RT	19. Elev. Casinghead 6425.5	
20. Total Depth 3062'	21. Plug Back T.D. 754'	22. If Multiple Compl., How Many	23. Intervals Drilled By All	Rotary Tools	Cable Tools
24. Producing Interval(s), of this completion - Top, Bottom, Name 738-751 Hospah-Gallup sandstone					25. Was Directional Survey Made No
26. Type Electric and Other Logs Run SP, Gamma Ray, Single Point Resistivity					27. Was Well Cored Yes 730-50
28. CASING RECORD (Report all strings set in well)					
CASING SIZE	WEIGHT LB./FT.	DEPTH SET	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
7"	20	64'	9-5/8"	12 Sacks - Circulated	None
4 1/2"	9.5	731'	6-1/4"	75 Sacks - Circulated	None
29. LINER RECORD					
SIZE	TOP	BOTTOM	SACKS CEMENT	SCREEN	PACKER SET
				2-3/8 EUE	744'
31. Perforation Record (Interval, size and number)			32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.		
			DEPTH INTERVAL	AMOUNT AND KIND MATERIAL USED	
			OH 731-54	5,000 gal. lease crude & 4,000# 10-20 sand	
33. PRODUCTION					
Date First Production 5-21-74		Production Method (Flowing, gas lift, pumping - Size and type pump) Flowing			Well Status (Prod. or Shut-in) Producing
Date of Test 5/22-23/74	Hours Tested 27	Choke Size open	Prod'n. Per Test Period Oil - Bbl. 16 Gas - MCF 0 Water - Bbl. 48 Gas - Oil Ratio 0		
Flow Taking Press. 0	Casing Pressure 80 PSIG	Calculated 24-Hour Rate 14	Oil - Bbl. 16 Gas - MCF 0 Water - Bbl. 43 Oil Gravity - API (Corr.) 33		
34. Disposition of Gas (Sold, used for fuel, vented, etc.) None produced					Test Witnessed By Mark Weidler
35. List of Attachments					
36. I hereby certify that the information shown on both sides of this form is true and complete to the best of my knowledge and belief.					
SIGNED <u>Lloyd Davidson</u>		TITLE <u>President</u>		DATE <u>5-25-74</u>	

INSTRUCTIONS

This form is to be filed with the appropriate District Office of the Commission not later than 20 days after the completion of any newly-drilled or deepened well. It shall be accompanied by one copy of all electrical and radio-activity logs run on the well and a summary of all special tests conducted, including drill stem tests. All depths reported shall be measured depths. In the case of directionally drilled wells, true vertical depths shall also be reported. For multiple completions, Items 30 through 34 shall be reported for each zone. The form is to be filed in quintuplicate except on state land, where six copies are required. See Rule 1105.

INDICATE FORMATION TOPS IN CONFORMANCE WITH GEOGRAPHICAL SECTION OF STATE

Southeastern New Mexico

Northwestern New Mexico

T. Anhy	T. Canyon	T. Ojo Alamo	T. Penn. "B"
T. Salt	T. Strawn	T. Kirtland-Fruitland	T. Penn. "C"
B. Salt	T. Atoka	T. Pictured Cliffs	T. Penn. "D"
T. Yates	T. Miss	T. Cliff House	T. Leadville
T. 7 Rivers	T. Devonian	T. Menefee	T. Madison
T. Queen	T. Silurian	T. Point Lookout	T. Eibert
T. Grayburg	T. Montoya	T. Mancos	T. McCracken
T. San Andres	T. Simpson	T. Gallup	T. Ignacio Qtzite
T. Glorieta	T. McKee	Base Greenhorn	T. Granite
T. Paddock	T. Ellenburger	T. Dakota	T.
T. Blinberry	T. Gr. Wash	T. Morrison	T.
T. Tubb	T. Granite	T. Todilto	T.
T. Drinkard	T. Delaware Sand	T. Entrada	T.
T. Abo	T. Bone Springs	T. Wingate	T.
T. Wolfcamp	T.	T. Chinle	T.
T. Penn.	T.	T. Permian	T.
T. Cisco (Bough C)	T.	T. Penn. "A"	T.

FORMATION RECORD (Attach additional sheets if necessary)

From	To	Thickness in Feet	Formation	From	To	Thickness in Feet	Formation
0	731	731	Upper Mancos Shale				
731	815	84	Hospah-Gallup Zone				
815	907	92	Massive Gallup sand				
907	1586	679	Lower Mancos Shale				
1586	1623	37	Greenhorn limestone				
1623	1660	37	Graneros Shale				
1660	1833	173	Dakota "A" & "B" zone				
1833	1938	105	Dakota "D" zone				
1938	2000	62	Dakota "E" zone				
2000	2850	850	Morrison				
2850	2958	108	Bluff sandstone				
2958	3045	87	Todilto limestone				
3045	3062	17	Entrada sandstone				

Northern Minerals, Inc.

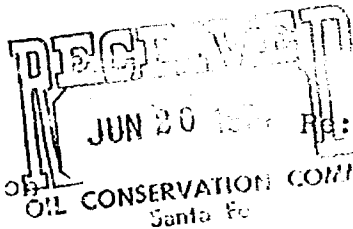
TELEPHONE (505) 983-9689

LLOYD DAVIDSON
President

P. O. Box 2182
SANTA FE, NEW MEXICO 87501

June 20, 1974

Mr. A. L. Porter, Jr.
Secretary-Director
Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501



Dear Sir:

Applicant in this case, Northern Minerals, Inc., requests permission to continue injecting water in it's 6-Y well, without tubing, for an additional six months period.

To date 40,470 barrels water have been injected into the Hospah formation and 3,404 barrels oil produced. None of this oil would have been produced without the water flood.

At no time has the injection pressure exceeded 680 pounds. One of the things we have learned in this pilot program is that we get better performance when the pressure is kept under 600 pounds. Also, in the beginning we were injecting on the order of 300 to 500 barrels water daily. This has been cut back to about 200 barrels per day.

We have had no indication that the injected water is getting into any other formation but the Hospah. We received response in the oil producing wells after only 3,000 barrels water had been injected.

We are continuing our testing program. We have recently installed a timer on the injection well whereby water is injected for one hour - four times per day. This holds down the injection pressure and allows the water to disperse in the Hospah more evenly. We believe this will result in greater oil and less water production.

To force us now, right in the middle of our pilot program, to open the well up and run tubing would mean the loss of the pressure we have built up and make for an uneven distribution of the water injected.

We feel that an additional period of operating as we are now, for a period of six months, will tell us the facts we need in order to know if the program will produce oil in commercial amounts.

Very truly yours,

Northern Minerals, Inc.

By: *Lloyd Davidson*
Lloyd Davidson, President



OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO
P. O. BOX 2088 - SANTA FE
87501

November 7, 1973

GOVERNOR
BRUCE KING
CHAIRMAN
LAND COMMISSIONER
ALEX J. ARMJO
MEMBER
STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

Mr. Lloyd Davidson, President
Northern Minerals, Inc.
Post Office Box 2182
Santa Fe, New Mexico

Re: Case No. 5072
Order No. R-4649
Applicant:
Northern Minerals, Inc.

Dear Sir:

Enclosed herewith are two copies of the above-referenced
Commission order recently entered in the subject case.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/ir

Copy of order also sent to:

Hobbs OCC X
Artesia OCC
Aztec OCC X

Other State Engineer Office

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE NO. 5072
Order No. R-4649

APPLICATION OF NORTHERN MINERALS,
INC. FOR A WATERFLOOD PROJECT,
MCKINLEY COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on October 3, 1973,
at Santa Fe, New Mexico, before Examiner Richard L. Stamets.

NOW, on this 6th day of November, 1973, the Commission,
a quorum being present, having considered the testimony, the
record, and the recommendations of the Examiner, and being
fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by
law, the Commission has jurisdiction of this cause and the subject
matter thereof.

(2) That the applicant, Northern Minerals, Inc., seeks
authority to institute a waterflood project in an undesignated
Gallup Oil Pool by the injection of water into the Gallup forma-
tion through the casing of its Santa Fe Pacific Well No. 6-Y
located 2013 feet from the North line and 2003 feet from the
East line of Section 29, Township 16 North, Range 6 West, NMPM,
McKinley County, New Mexico.

(3) That the applicant has discovered a separate common
source of supply in the Gallup formation by said well and that
such pool lacks sufficient natural reservoir energy for
economical primary production.

(4) That applicant proposes to inject water into the
Gallup formation through 4 1/2 inch casing into the open hole
interval 734 feet to 744 feet in said well No. 6-Y in a six
month pilot program to attempt to stimulate production.

(5) That the mechanics of the injection in the proposed
pilot project are feasible, provided that injection down the
casing should be for a period no longer than 6 months and that
injection pressure does not exceed 750 psi.

-2-

Case No. 5072
Order No. R-4649

(6) That injection should be discontinued after the expiration of the 6 month pilot period or, if continued, should take place through tubing set in a packer located as close as practicable to the casing shoe at a pressure not in excess of 750 psi.

(7) That the proposed waterflood project should result in the recovery of oil which would otherwise not be economically recovered, thereby preventing waste.

(8) That the operator should take all steps necessary to ensure that the injected water enters only the proposed injection interval and is not permitted to escape to other formations or onto the surface from injection, production, or plugged and abandoned wells.

(9) That the subject application should be approved and the project should be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

IT IS THEREFORE ORDERED:

(1) That the applicant, Northern Minerals, Inc., is hereby authorized to institute a waterflood project in an undesignated Gallup Oil Pool by the injection of water into the Gallup formation in the open-hole interval from 734 feet to 744 feet through the casing of its Santa Fe Pacific Well No. 6-Y, located 2013 feet from the North line and 2003 feet from the East line of Section 29, Township 16 North, Range 6 West, NMPM, McKinley County, New Mexico.

PROVIDED HOWEVER, that injection pressure shall not exceed 750 psi and injection of water shall be discontinued after the expiration of the 6-month pilot period or, if continued, take place through tubing set in a packer located as close as practicable to the casing shoe and the casing tubing annulus shall be loaded with an inert fluid and equipped with a pressure gauge or other leak-sensing device in order to detect any leakage in the tubing, casing or packer.

(2) That the operator shall immediately notify the supervisor of the Commission's Aztec district office of the failure of the casing, tubing or packer in the injection well or the leakage of water or oil from any plugged and abandoned well within the project area and shall take such timely steps as may be necessary or required to correct such failure or leakage.

(3) That the subject waterflood project is hereby designated the Northern Minerals McKinley Gallup Waterflood Project and shall be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

-3-

Case No. 5072

Order No. R-4649

(4) That monthly progress reports of the waterflood project herein authorized shall be submitted to the Commission in accordance with Rules 704 and 1120 of the Commission Rules and Regulations.

(5) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION



I. R. Trujillo
I. R. TRUJILLO, Chairman

Alex J. Armijo
ALEX J. ARMÍJO, Member

A. L. Porter Jr.
A. L. PORTER, Jr., Member & Secretary

S E A L

dr/

BEFORE EXAMINER STAMETS
OIL CONSERVATION COMMISSION
Applicants EXHIBIT NO. 1
CASE NO. 5072
Submitted by Northern Minerals
Hearing Date Oct. 3, 1973

NORTHERN MINERALS, INC.
APPLICATION FOR WATERFLOOD
MIGUEL CREEK DOME
McKINLEY COUNTY, NEW MEXICO

PREPARED BY: Mark E. Weidler
Consultant Petroleum Geologist
AIPG No. 2488

NORTHERN MINERALS, INC.
APPLICATION FOR WATERFLOOD
MIGUEL CREEK DOME
McKINLEY COUNTY, NEW MEXICO

Background & Proposed Plan

Northern Minerals, Inc., proposes to undertake a pilot waterflood of the Hospah sandstone in SW/4 NE/4 section 29, T. 16 N., R. 6 W., McKinley County, New Mexico. Oil bearing sandstone in the Hospah zone at depth of 730' to 770' were recovered in cores from the following wells: SFP No. 6, SFP No. 7, SFP No. 8 and the Water Supply Well (See Figure No. 2). In addition, oil has been recovered in production tests of SFP-6Y.

Oil gravity is 31° to 33° API. The crude oil is nearly devoid of associated petroleum gases in the methane through pentane range, thereby making primary production by normal reservoir energy impractical. A weak hydraulic gradient, slightly in excess on hydrostatic is present indicating possibility at a weak natural water drive. Addition of reservoir energy by water injection should significantly increase production rates and recovery of oil in place. A water supply is available from the Massive Gallup sandstone at a depth of 810 feet (Figure No. 3). A test of the water supply well capacity was made September 26-27, 1973. The well flowed 380 barrels of water through a 1 inch Flotrac Water Meter with 20 to 40 PSI back pressure on the inlet side. Closed in pressure is 73 PSIG.

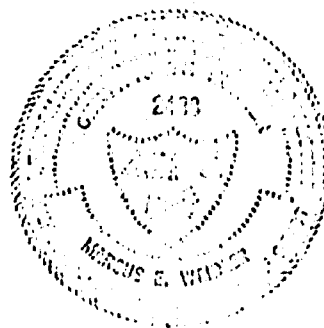
We proposed to take Gallup water from the water supply well and inject into the Hospah sandstone in SFP-6Y (Figure No. 4). A Gaso Model

3364 injection pump will be utilized. Injection pressures up to 750 PSI will be used to initiate injection. Anticipated working injection pressures will be 400 to 600 PSI. Estimated injection volume will be 50 to 300 BWPD and will be determined by the manner in which the reservoir accommodates injected water at these pressures.

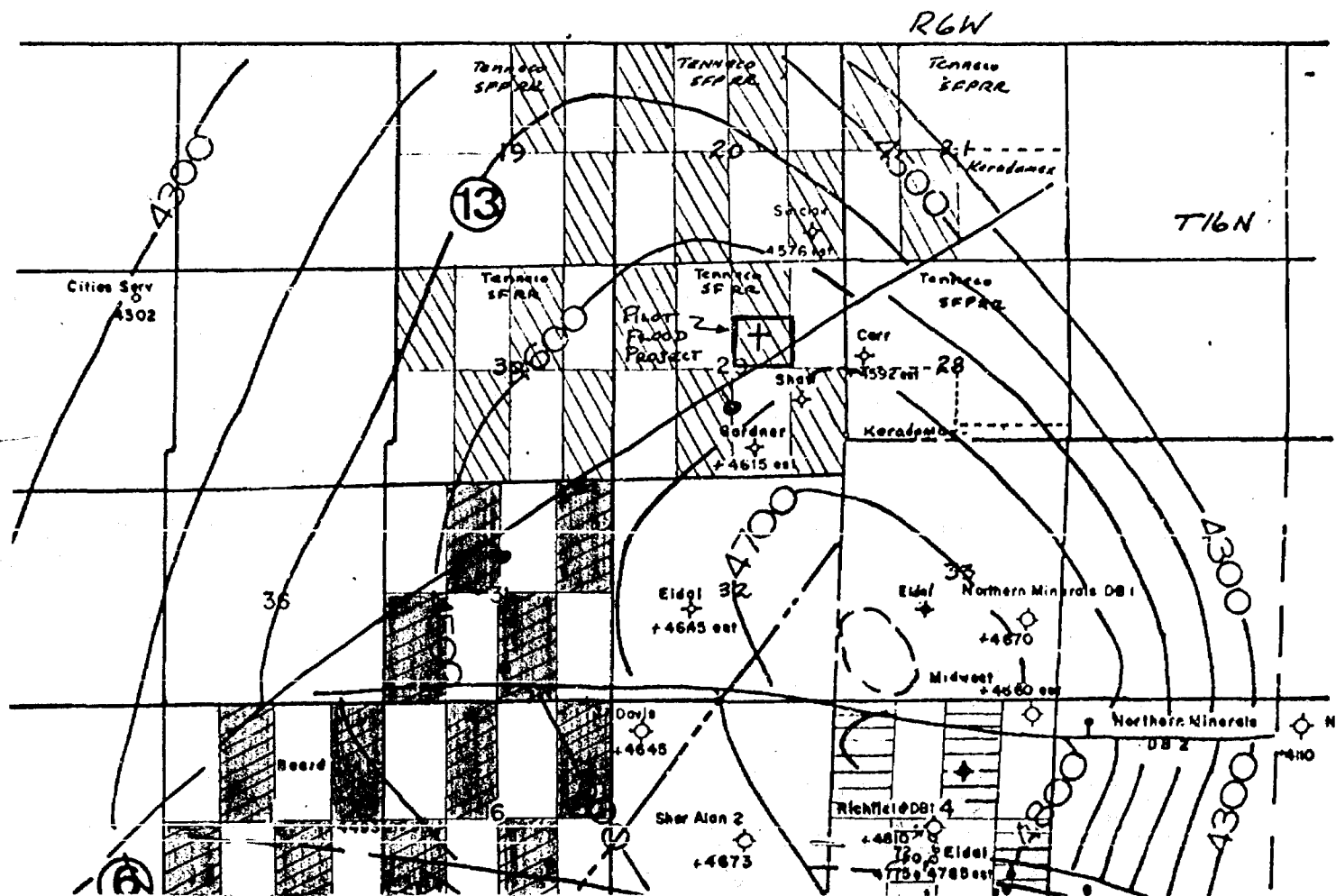
Wells SFP No. 7 (Figure No. 5) and SFP No. 8 (Figure No. 8) will be produced. Produced fluids will be pumped into a 300 bbl stand-up tank located at SFP No. 8. Casing head pressure will be monitored on both producing wells.

Mark E. Weidler

Mark E. Weidler
Consulting Petroleum Geologist
Colorado Plateau Geological Services, Inc.
Farmington, New Mexico



NORTHERN MINERALS, INC.



CONTOURS ON DAKOTA "D" SAND
C.I. 100'



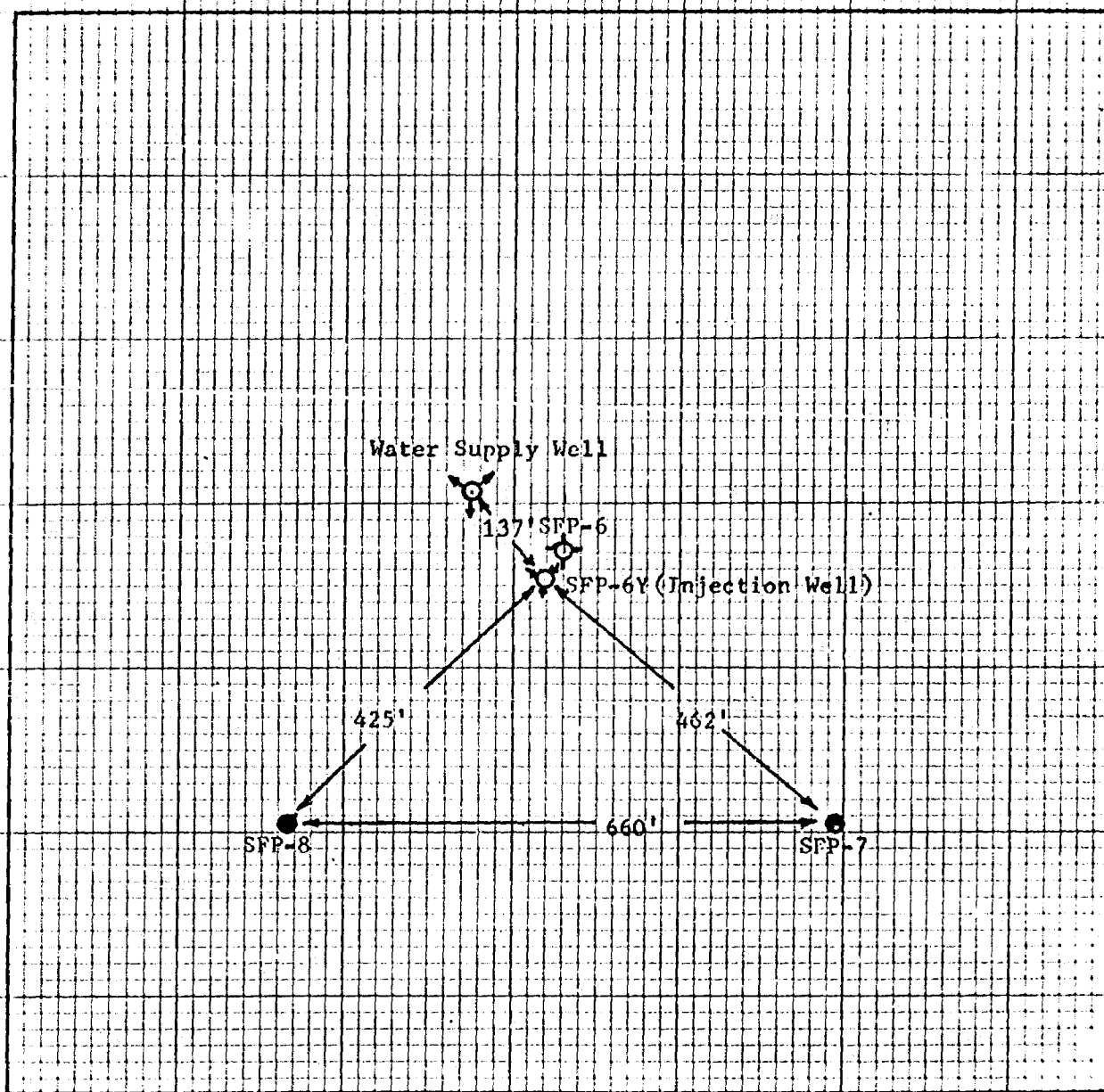
NORTHERN MINERALS, INC. LEASEHOLDS

MEW:9/73

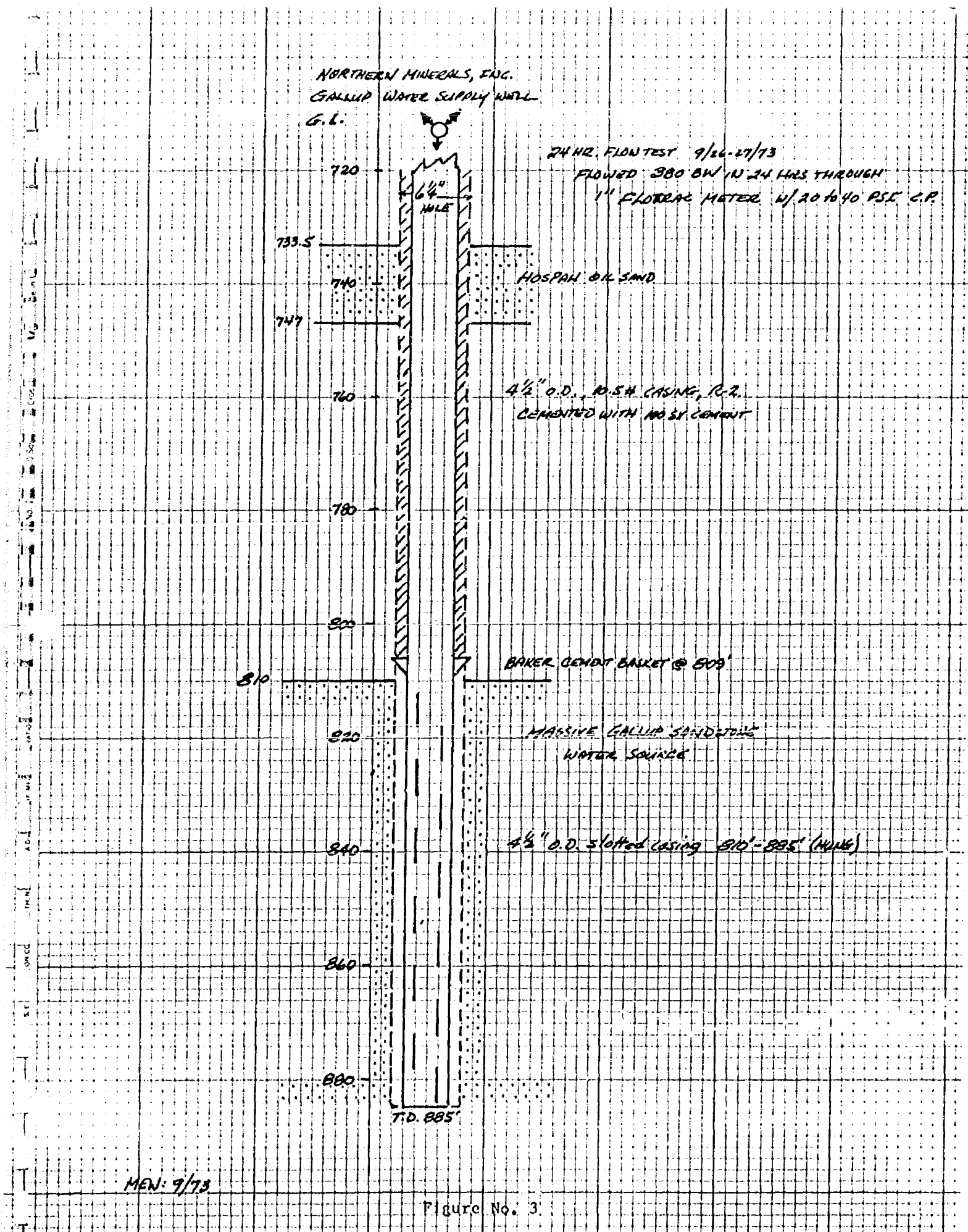
Figure No. 1

NORTHERN MINERALS, INC.

Plat of SW/4 NE/4, Section 29-T16N-R6W
McKinley County, New Mexico



Scale: 1" = 200'



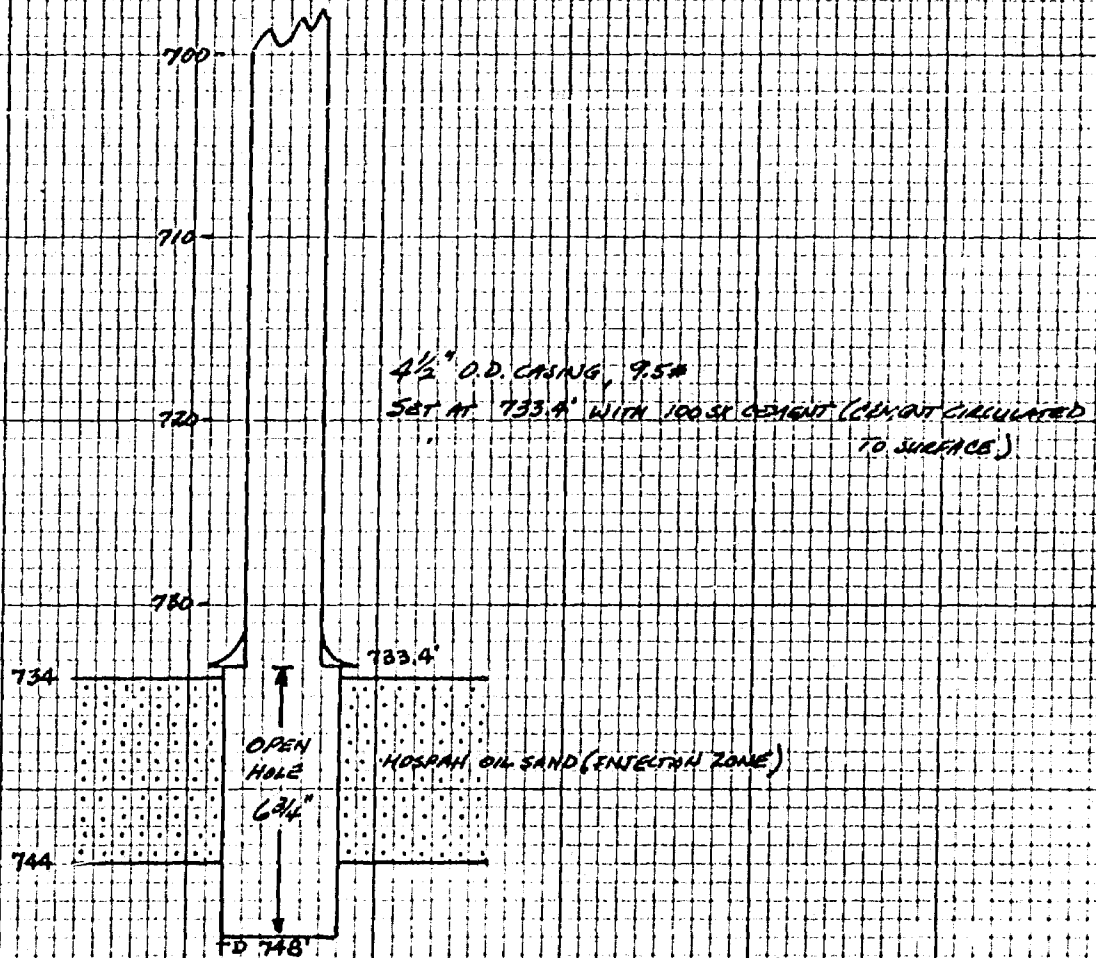
MEN: 9/73

Figure No. 3

NORTHERN MINERALS, INC.
SANTA FE PACIFIC No. 6Y
(INJECTION WELL)

GROUND LEVEL = 6428'

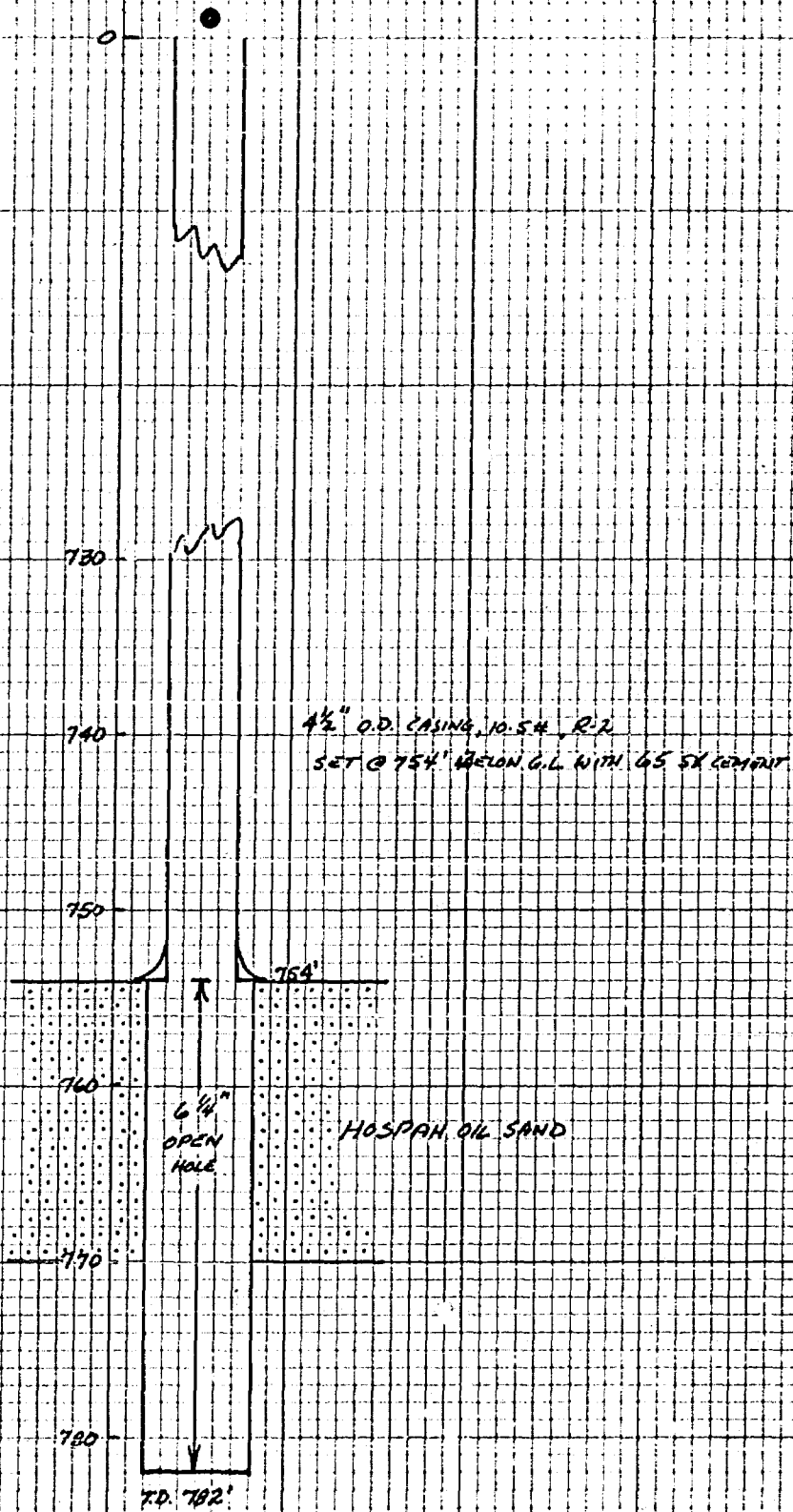
6 3/4" HOLE



MEW: 9/73

Figure No. 4

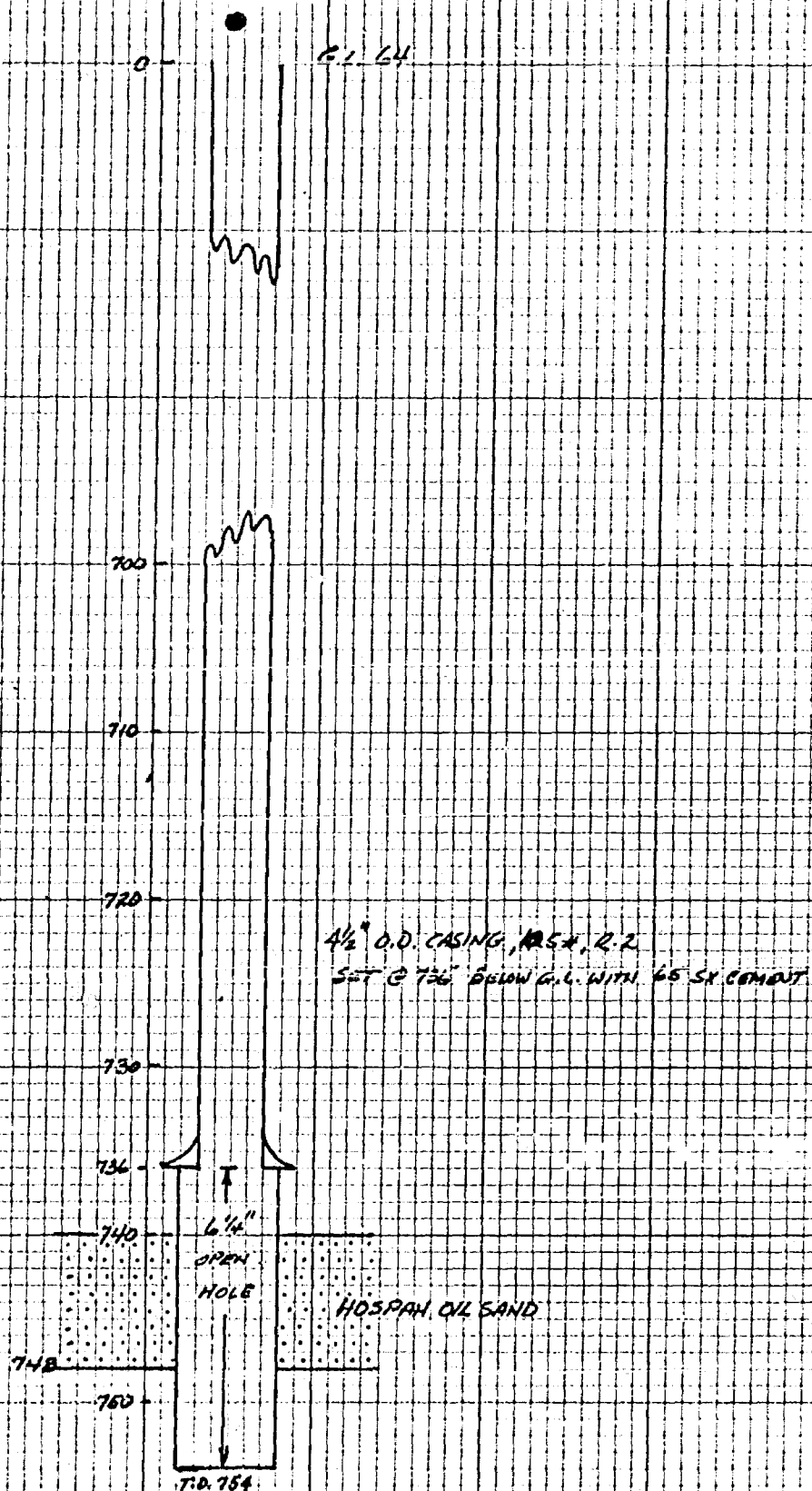
NORTHERN MINERALS, INC.
SANTA FE PACIFIC No. 87
OIL PRODUCER



MEN 9/73

Figure No. 5

NORTHERN MINERALS, INC.
SANTA FE PACIFIC No. 8
OIL PRODUCER.



MEN 9/73

Figure No. 6

Request for WF

Applicant disc a SC
S of Supply with #
6Y well

That pool discovered lacks
sub res eqy for economical
primary production.

That institution of a WF in
said under Gallup pool
may result in the recovery
of oil which could otherwise
be effie or econ recovered

That applicant proposes to inject
water in the 6Y well down
the casing into the Oil section
from 733 - 748 ft.

That the mechanics of such
injection are reasonable
~~provide that~~ in the proposed
pilot project provide that
injection down the casing
shall be for a period no
longer than 6 months

That after ~~6~~ 6 mo's
~~injection~~ pilot period,
injection down the casing
should be discontinued
and subsequent water injection
should be thru tubing under
a packer.

~~That after install~~

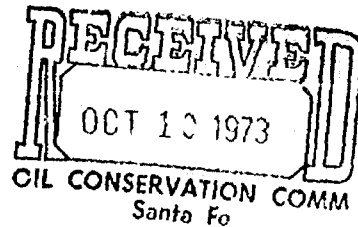
(Check recent water flood
for ~~st~~ water loss
wording)

(Max Inj Press 750 #)

Northern Minerals, Inc.

TELEPHONE (505) 983-9689

LLOYD DAVIDSON
President



P. O. Box 2182
SANTA FE, NEW MEXICO 87501

October 8, 1973

Mr. Richard L. Stamets
Oil Conservation Commission
State Land Office Building
Santa Fe, New Mexico 87501

Dear Sir:

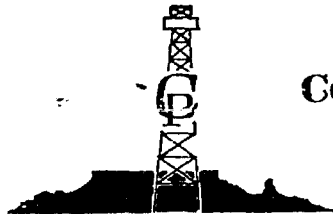
Re: Case No. 5072
Application of Northern
Minerals, Inc. for
Waterflood, McKinley
County.

Enclosed is statement by Mark E. Weidler regarding the calculated fracture pressure of the Hospah sand at the location of the Northern Minerals, Inc. No. 6-Y SFPRR (injection well) in the SWNE section 29, T16N-R6W.

Sincerely,

Northern Minerals, Inc.

Lloyd Davidson
By: Lloyd Davidson



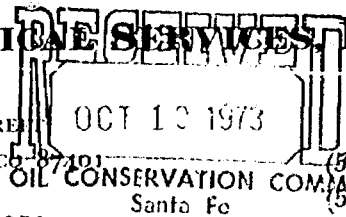
- ☆ Surface & Sub-Surface Studies
- ☆ Well Site Supervision
- ☆ Exploration Program Planning & Supervision
- ☆ Property Development and Management

COLORADO PLATEAU GEOLOGICAL SERVICES, INC.

SUITE 2D

413 WEST MAIN STREET
FARMINGTON, NEW MEXICO 87401

October 5, 1973



(505) 325-9671

(505) 325-3641

(505) 325-7855

Mr. Lloyd Davidson
Northern Minerals, Inc.
P. O. Box 2182
Santa Fe, New Mexico 87501

RE: Miguel Creek Dome
Pilot Hospah Water Flood
Fracture Pressure Data

Dear Mr. Davidson:

I submit the following data for your transmittal to Mr. Richard Stamets, Examiner for the New Mexico Oil Conservation Commission, in response to his request made at the hearing on your Case 5072, October 3, 1973.

Based on data obtained from service companies on breakdown and treating pressures for the Hospah sand in Hospah and South Hospah fields, the fracture gradient for this formation ranges from a minimum of 1.07 PSI/ft. to a maximum of 1.40 PIS/ft. Therefore, fracture pressure for the Hospah sand in SFP-6Y (injection well) calculates to be in the range from about 790 PSI minimum to 1,035 PSI maximum. I expect to obtain adequate injection rates for the pilot flood well below these pressures. As mentioned in our application, we do not plan to exceed 750 PSI.

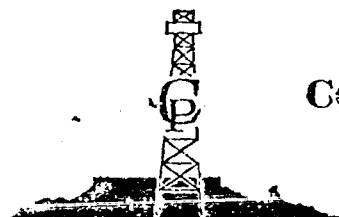
Water analysis on Gallup injection water will be forwarded to you in the near future.

Yours very truly,

Mark E. Weidler

Mark E. Weidler,
Vice President

MEW:no



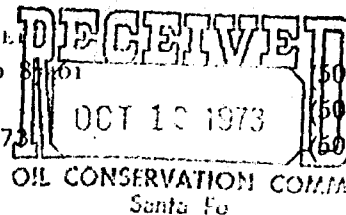
- ☆ Surface & Sub-Surface Studies
- ☆ Well Site Supervision
- ☆ Exploration Program Planning & Supervision
- ☆ Property Development and Management

COLORADO PLATEAU GEOLOGICAL SERVICES, INC.

SUITE 2D

413 WEST MAIN STREET
FARMINGTON, NEW MEXICO 87401

October 5, 1973



(505) 325-9671
(505) 325-3641
(505) 325-7855

Mr. Lloyd Davidson
Northern Minerals, Inc.
P. O. Box 2182
Santa Fe, New Mexico 87501

RE: Miguel Creek Dome
Pilot Hospah Water Flood
Fracture Pressure Data

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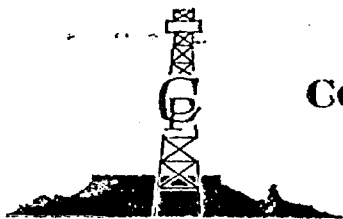
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Yours very truly,

Mark E. Weidler,
Vice President

MEV:no



- ☆ Surface & Sub-Surface Studies
- ☆ Well Site Supervision
- ☆ Exploration Program Planning & Supervision
- ☆ Property Development and Management

COLORADO PLATEAU GEOLOGICAL SERVICES, INC.

SUITE 2D

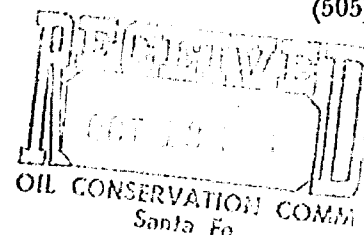
413 WEST MAIN STREET
FARMINGTON, NEW MEXICO 87401

October 10, 1973

(505) 325-9671

(505) 325-3641

(505) 325-7855



Mr. Lloyd Davidson
President, Northern Minerals, Inc.
P. O. Box 2182
Santa Fe, New Mexico 87501

Re: Water Analysis
Injection Water
Pilot Water Flood

Dear Mr. Davidson:

Further to my letter of October 5, 1973, I submit the following results of analysis of a water sample collected October 8, 1973, from your Gallup sand water supply well at Miguel Creek Dome. The analysis was made by Mr. John Alexander, District Engineer for Halliburton Services in Farmington.

Resistivity-----7.58 ohms @ 62° F.
Specific Gravity-----1.01
pH-----7.5
Calcium and Magnesium-----0
Chlorides-----50.6 ppm
Sulphates-----1500 ppm
Bicarbonate-----293 mg/l
Iron-----Nil

This analysis was requested by Mr. Richard Stamets, Examiner for NMOCG, at the hearing on your water flood application (Case 5072) October 3, 1973.

Please let me know if I can be of further assistance.

Very truly yours,

Mark E. Weidler

Mark E. Weidler
Consultant Petroleum Geologist

MEW:no

ref 710 5072

Submitted by Mark E. Weidler Date Received 10-9-73
Well No. Water Supply Well Depth 810-885 Formation Massive Gallun
County McKinley Field Unnamed (Miguel Creek Dome) Source _____

Analysis made by John Alexander, Halliburton Services

Docket No. 27-73

DOCKET: EXAMINER HEARING - WEDNESDAY - OCTOBER 3, 1973

9 A.M. - OIL CONSERVATION COMMISSION CONFERENCE ROOM,
STATE LAND OFFICE BUILDING - SANTA FE, NEW MEXICO

The following cases will be heard before Richard L. Stamets, Examiner, or Daniel S. Nutter, Alternate Examiner:

- ALLOWABLE: (1) Consideration of the allowable production of gas for November, 1973, from seventeen prorated pools in Lea, Eddy, Roosevelt and Chaves Counties, New Mexico;
- (2) Consideration of the allowable production of gas from nine prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico, for November, 1973.

CASE 5044: (Continued from the August 9, 1973, Examiner Hearing)

In the matter of the hearing called by the Oil Conservation Commission on its own motion to permit Sycor Newton, Peru Milling Company, R. E. Deming and Aetna Life and Casualty Company and all other interested parties to appear and show cause why the State L 6350 Well No. 1 located in Unit M of Section 10, Township 23 South, Range 11 West, Luna County, New Mexico, should not be plugged and abandoned in accordance with a Commission-approved plugging program.

CASE 5069: Application of Sun Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the dual completion of its Annie Christmas Well No. 1 located in Unit N of Section 1, Township 22 South, Range 37 East, Lea County, New Mexico, to produce gas from an undesignated Abo gas pool and oil from the Wantz-Granite Wash Pool through parallel strings of tubing.

CASE 5070: Application of Amoco Production Company for a unit agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of the Bubbling Spring Unit Area comprising 3078 acres, more or less, of Federal and Fee lands in Township 20 South, Range 26 East, Eddy County, New Mexico.

CASE 5071: Application of Texas West Oil & Gas Corporation for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the dual completion of its State "2" Well No. 2 located in Unit K of Section 2, Township 24 South, Range 34 East, Antelope Ridge Field Area, Lea County, New Mexico, to produce gas from the Atoka and Morrow formations through parallel strings of tubing.

CASE 5072: Application of Northern Minerals, Inc. for a waterflood project, McKinley County, New Mexico. Applicant, in the above-styled cause, seeks

(Case 5072 continued from Page 1)

authority to institute a pilot waterflood project by the injection of water into the Hospah sand of the Gallup formation in the open-hole interval from 734 feet to 744 feet in its Santa Fe Pacific Well No. 6-Y located 2013 feet from the North line and 2003 feet from the East line of Section 29, Township 16 North, Range 6 West, undesignated Gallup Pool, McKinley County, New Mexico.

CASE 5055: (Continued and Readvertised)

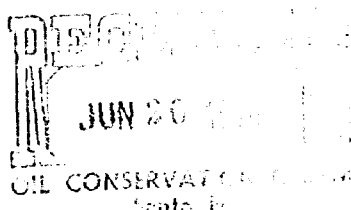
Application of Merrion & Bayless for downhole commingling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Gallup, Greenhorn, and Dakota oil and gas production within the wellbore of the Canada Mesa Well No. 3 located in Unit A of Section 14, Township 24 North, Range 6 West, Devils Fork Field, Rio Arriba County, New Mexico.

CASE 5073: Application of Belco Petroleum Corporation for a non-standard gas proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for a 320-acre non-standard gas proration unit comprising the E/2 SW/4 and SE/4 of Section 30 and the N/2 NE/4 of Section 31, all in Township 20 South, Range 33 East, South Salt Lake Field, Lea County, New Mexico, to be dedicated to a well to be drilled either in the center of Unit O of said Section 30, or at an unorthodox location in the center of Unit P of said Section 30.

Northern Minerals, Inc.

TELEPHONE (505) 983-9689

LLOYD DAVIDSON
President



P. O. Box 2182
SANTA FE, NEW MEXICO 87501

June 20, 1974

Mr. A. L. Porter, Jr.
Secretary-Director
Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Re: Case No. 5072
Order No. R-4649

Dear Sir:

Applicant in this case, Northern Minerals, Inc., requests permission to continue injecting water in it's 6-Y well, without tubing, for an additional six months period.

To date 40,470 barrels water have been injected into the Hospah formation and 3,404 barrels oil produced. None of this oil would have been produced without the water flood.

At no time has the injection pressure exceeded 680 pounds. One of the things we have learned in this pilot program is that we get better performance when the pressure is kept under 600 pounds. Also, in the beginning we were injecting on the order of 300 to 500 barrels water daily. This has been cut back to about 200 barrels per day.

We have had no indication that the injected water is getting into any other formation but the Hospah. We received response in the oil producing wells after only 3,000 barrels water had been injected.

We are continuing our testing program. We have recently installed a timer on the injection well whereby water is injected for one hour - four times per day. This holds down the injection pressure and allows the water to disperse in the Hospah more evenly. We believe this will result in greater oil and less water production.

To force us now, right in the middle of our pilot program, to open the well up and run tubing would mean the loss of the pressure we have built up and make for an uneven distribution of the water injected.

We feel that an additional period of operating as we are now, for a period of six months, will tell us the facts we need in order to know if the program will produce oil in commercial amounts.

Very truly yours,

Northern Minerals, Inc.

By: *Lloyd Davidson*
Lloyd Davidson, President

Tenneco Oil
A Tenneco Company

Suite 1200
Lincoln Tower Building
Denver, Colorado 80203
(303) 292-9920



September 13, 1973

New Mexico Oil Conservation Commission
Santa Fe, New Mexico

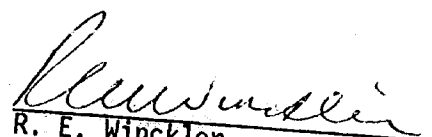
RE: Proposed Waterflood
Northern Minerals, Inc.
W $\frac{1}{2}$ NE $\frac{1}{4}$ Section 29, T16N, R6W
San Miguel North Area
McKinley County, New Mexico

Gentlemen:

With reference to a letter directed to you from Northern Minerals, Inc. dated August 30, 1973 pertaining to a proposed waterflood on the subject acreage, kindly be advised that Tenneco Oil Company as a working interest owner in all of the acreage offsetting the proposed flood has no objection to said waterflood as proposed by Northern Minerals in the above letter.

Sincerely,

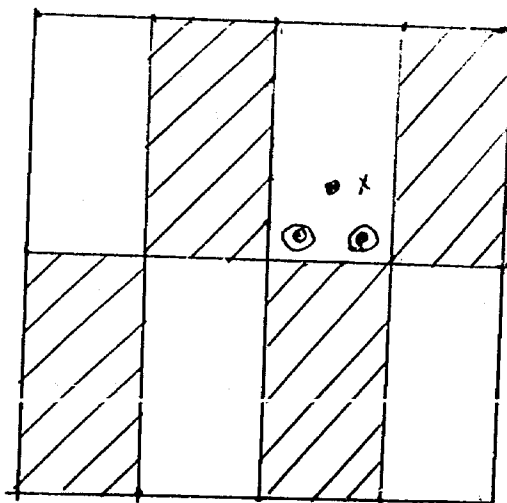
TENNECO OIL COMPANY


R. E. Winckler,
Division Landman

REW:vds

cc: Northern Minerals, Inc.
P. O. Box 2182
Santa Fe, New Mexico 87501

Section 29, T16N-R6W. Showing proposed
producing wells, injection well and water
well; and lease ownership.



• - Injection well

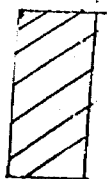
X - Water well

⊙ Producing oil wells

⊙



Northern Minerals, Inc. acreage



Tenneco Oil Company acreage

Case 5072

INJECTION WELL

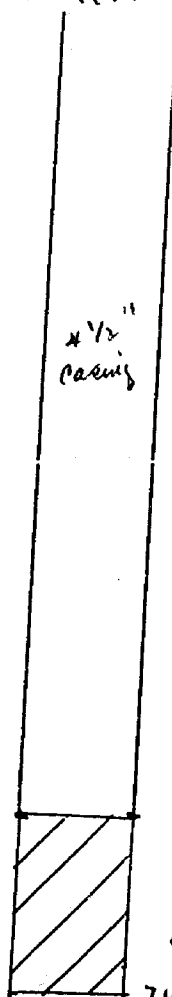
SURFACE

$\times \frac{1}{2}$ "
casing

734'

HOSPITAL
OPEN HOLE

744'



Case 5072

Northern Minerals, Inc.

TELEPHONE (505) 963-9689

LLOYD DAVIDSON
President

P. O. Box 2182
SANTA FE, NEW MEXICO 87501

August 30, 1973

Rec'd 8/31/73
Jen

New Mexico Oil Conservation Commission
Santa Fe, New Mexico

Gentlemen:

Northern Minerals, Inc., requests permission to drill two wells to test the Hospah formation at about 735' on one 40 acre tract; to use one well already on this tract to inject water in the Hospah; and to drill a water supply well to the Massive Gallup at about 850'.

Northern Minerals, Inc., No. 6-Y SFPRR was drilled to a total depth of 748'. 4½" casing was run to 734'. The well has been tested on pump for about 10 days and is capable of producing 33 gravity oil at the rate of about one-half barrel per day along with 4½ barrels water. This well is located 2013' FNL and 2003' FEL of section 29, T16N-R6W, McKinley County. A core analysis of this well shows some 9½ feet of oil sand. There is no associated gas. The well is producing only what fluid comes into the well bore through gravity.

Northern Minerals believes that substantial quantities of oil can be produced from this formation in this area if the oil is forced into the well bore through a water flood.

It is desired to drill an additional well to the Hospah sand 330' from the West line and 330' from the South line of the West half of the Northeast one-quarter section of said section 29 and to drill a secone well 330' out of the southeast quarter of this quarter-quarter section. These wells would be completed with pumps and used as producing wells. The present well, No. 6-Y, would be converted to an injection well. This well is located approximately in the center of the said quarter-quarter section. A well would be drilled some 50 feet of the injection well for water supply. This well would be drilled to about 850 feet in the Massive Gallup and cased with 4½" casing with cement from top to bottom. This would be an open hole completion. A recent well in this area flowed water from the Gallup at the rate of about 2,000 barrels per day.

DOCKET MAILED

Date 9-21-73

(2)

Water would be injected into the Hospah at the rate of about 25 to 50 barrels per day to begin with and under a pressure of 400 to 500 pounds per square inch. The injection rate would be gradually increased to 100 to 150 barrels per day.

It is believed that this pilot program would establish if the Hospah sand in this area will take water and if the pressure thus applied will result in increased oil production in the two wells completed as producing wells.

There are no oil producing wells within a two mile radius of the proposed injection well.

Northern Minerals, Inc., has a farmout agreement with Tenneco Oil Company which has a lease on section 29, T16N-R6W from Santa Fe Pacific Railroad Company. Northern will earn an assignment to the $W\frac{1}{2}NE\frac{1}{4}$, $W\frac{1}{2}NW\frac{1}{4}$, $E\frac{1}{2}SE\frac{1}{4}$ and $E\frac{1}{2}SW\frac{1}{4}$ if commercial production of oil is established on any of this land. Tenneco will retain ownership to the other half of this section. Thus, Northern Minerals, Inc., and Tenneco are the only interested lease owners of the land upon which the proposed pilot water-flood would be located and any off-setting land, North, East, South and West. Tenneco has agreed to the installation of the proposed water-flood.

It is requested, therefore, that permits for the wells herein described be allowed and that the injection program as outlined be approved.

Very truly yours,

Northern Minerals, Inc.

Lloyd Davidson

By: Lloyd Davidson

DRAFT

TWD/dr

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE NO. 5072

Order No. R- 4649

APPLICATION OF NORTHERN MINERALS, INC.
FOR A WATERFLOOD PROJECT, MCKINLEY
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on October 3, 1973,
at Santa Fe, New Mexico, before Examiner Richard L. Stamets.

NOW, on this day of , 1973, the Commission,
a quorum being present, having considered the testimony, the record,
and the recommendations of the Examiner, and being fully advised
in the premises,

FINDS:

(1) That due public notice having been given as required by
law, the Commission has jurisdiction of this cause and the subject
matter thereof.

(2) That the applicant, Northern Minerals, Inc., seeks
authority to institute a waterflood project in an undesignated
Gallup Pool, by the injection of water into ~~the Gallup Sand of~~
isolated, 2015 feet from the North line and 2005 feet from the East line of
the Gallup formation through the casing of its Santa Fe Pacific
Well No. 6-Y ~~located in Section 29, Township 16 North, Range 6 West,~~
Section 29, Township 16 North, Range 6 West,
NMPM, McKinley County, New Mexico.

(3) That the applicant has discovered a separate ~~source~~ source of supply in the Gallup formation ~~in~~ by said well and that such pool lacks sufficient natural reservoir energy for economical primary production.

(4) That applicant proposes to inject water into the Gallup formation through ~~the~~ ~~well~~ 4 1/2 casing in said well No 6Y in a six month pilot program to attempt to stimulate production, ~~as a result of~~ ~~the~~

into the open hole interval 734 feet to 744 feet

(3) That the pool discovered by applicant lacks sufficient reservoir energy for economical primary production.

(5) That the mechanics of the injection in the proposed pilot project are feasible, provided that injection down the casing should be for a period no longer than 6 months *and that injection pressure does not exceed 750 psi.*

(6) That injection should be discontinued after the expiration of the 6 month pilot period or, if continued, should take place through _____

_____ tubing set in a packer located as ~~close~~ *practicable* as possible to the casing shoe. *at a pressure not in excess of 750 psi.*

(7) That the proposed waterflood project should result in the recovery of oil which ~~could~~ *would* otherwise not be economically recovered, thereby preventing waste.

(8) That the operator should take all steps necessary to ensure that the injected water enters only the proposed injection interval and is not permitted to escape to other formations or onto the surface from injection, production, or plugged and abandoned wells.

(9) That the subject application should be approved and the project should be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

IT IS THEREFORE ORDERED:

(1) That the applicant, Northern Minerals, Inc., is hereby authorized to institute a waterflood project in ~~and~~ ^{an} undesignated Gallup ^{oil} Pool by the injection of water ~~into the Hesperia Sand of~~ the Gallup formation in the open-hole interval from 734 feet to 744 feet through the casing of its Santa Fe Pacific Well No. ~~6-V, located 2013 feet from the North line and 2003 feet from the East line of Section 29, Township 16 North, Range 6 West, NMPM, McKinley County, New Mexico.~~

into
OK →

*pressure shall not exceed
750 psi and injection*

PROVIDED HOWEVER, that injection of water shall be discontinued after the expiration of the 6-month pilot period or, if continued, take place through _____

tubing set in a packer located as ~~nearby~~ ^{close} as ~~possible~~ ^{practicable} to the casing shoe and the casing tubing annulus shall be loaded with an inert fluid and equipped with a pressure gauge or other leak-sensing device in order to detect any leakage in the tubing, casing or packer.

(2) That the operator shall immediately notify the supervisor of the Commission's ~~Hobbs~~ ^{Aztec} district office of the failure of the casing, tubing or packer in the injection well or the leakage of water or oil from any plugged and abandoned well within the project area and shall take such timely steps as may be necessary or required to ~~correct~~ ^{correct} such failure or leakage.

(3) That the subject waterflood project is hereby designated the Northern Mineral M. King ^{Gallup} Waterflood Project and shall be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

(4) That monthly progress reports of the waterflood project herein authorized shall be submitted to the Commission in accordance with Rules 704 and 1120 of the Commission Rules and Regulations.

(5) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.